FOS AND GOS AS FUNCTIONAL SWEETENERS

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OBJECTIVES

- To carry out a review of the production methods of FOS and GOS and the factors that influence its obtaining.
- To analyse the biotechnological proposals that are being investigated to improve their production.
- To study the functionality of these substances and the application in the food industry.

1

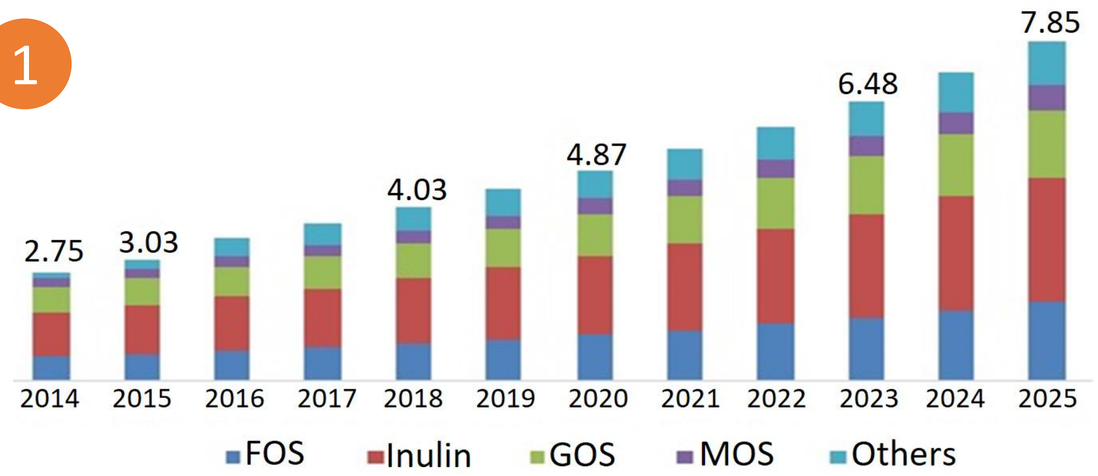

Fig.1. Prebiotic market forecast until 2025 in billion USD $ (Hexa Research 2018)

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- Prebiotic effect
- Better mineral absorption in the intestine: Ca^{2+} Mg^{2+}
- ↑ SCFA production and ↓ cholesterol level
- Possible reducers of risk factors for colon cancer
- Technological properties

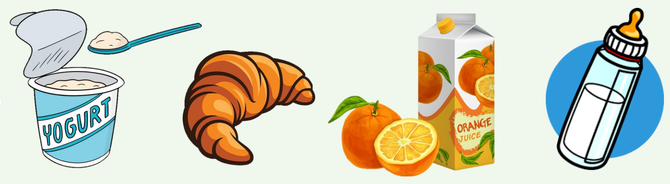
3

- Feeling of satiety
- Not cariogenic
- Low glycemic index
- Suitable for diabetics

→ Functional sweetener

✓ Dairy products, bakery, fruit juices, other beverages…

✓ Infant formulas



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FOS

Vegetal sources

Hydrolysis using endo- and exoinulinases

Enzymatic synthesis

Transfructosylation using β-D-Fructofuranosidases and β-D-Fructosyltransferases

GOS

Vegetal sources

Extraction of legumes and concentration process

Enzymatic synthesis

Transgalactosylation using β-Galactosidases

5

FOS

- ↑ [Sucrose] → 1-Kestose and Nystose
- ↓ [Sucrose] → long chain FOS and glucose ⚠
- pH and Temperature
- Enzyme source:

↑ Hydrolase activity → ↑ glucose and fructose ⚠

GOS

- ↑ [Lactose] → ↑ GOS production and long chain product
- ↓[Lactose] → ↑ hydrolysis ⚠
- Temperature
- Enzyme source

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Upstream processing

One or two-step bioprocess

Recombinant enzymes

Enzyme immobilization

Downstream processing

Activated charcoal

Size-exclusion chromatography

Simulated moving bed chromatography (SMB)

Nanofiltration

Microbial fermentation

CONCLUSIONS

- The interest in these oligosaccharides is increasing and that is why the market is constantly growing.
- The enzymatic synthesis is more common since a more standardized product is achieved.
- The substrate concentration and the origin of the enzyme are the most important factors to control.
- Upstream strategies such as recombinant enzymes and enzyme immobilization are a good option to improve the yield and reduce costs.
- In downstream processing, despite its cost, SMB offers a number of advantages over other techniques. However, the best strategy is to combine different methods to achieve the adequate purity.
- Its application in food industry is mainly due to its prebiotic effect and its use as a sugar replacement.